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Canyon Power Site of Olympic Power Company, Showing Spillway and Generating Station.

THE OLYMPIC POWER COMPANY'S SYSTEM

BY ORAN D. JONES.

(This article illustrates and describes the hydraulic and electric equipment of a hydroelectric plant on the Olympic Peninsula, Washington. A concluding installment will give details of how a fault in the original construction was repaired. The author is a civil engineer at Seattle.—The Editor.)

Coincident with the growth of the great electrical transmission network on the eastern shores of the Puget Sound, a considerable market for power has been built up on the western shores—a market that will increase with the development of this region, if potential resources may be considered a reliable criterion for economic growth with a progressive power company to constitute one of the most considerable assets of a community.

The pioneer corporation to enter this inviting field was the Olympic Power Company of Port Angeles. The description of their system may prove of interest, not only to the industrial promoter, since it represents the foremost factor in the growth of this new region, but also to the engineer, because of the numerous interesting problems encountered and overcome in the construction of the various component parts: dam, power house, transmission line, etc. The recent completion of the reconstruction and repair of the dam, the thorough testing of these new works under practical conditions, make timely their detailed description and discussion of the lessons to be learned therefrom.

The Olympic Power Company, anticipating the approaching development of this region, was incorporated in 1910, and contracts for the delivery of electric power were entered into. Today this corporation supplies power to the cities of Port Angles, Port Townsend, Sequim, Bremerton and Charlestown; to the United States forts—Flagler and Worden—forming a part of the national defensive system of Puget Sound; to the United States navy yard at Bremerton and in addition, to numerous saw mills and private industries.

The Elwha River, supplying the power for distribution by the Olympic Power Power Company, rises in the glaciers flanking Mount Olympus, and discharges into the straits of Juan de Fuca, two and one-half miles west of Port Angeles. The Elwha watershed of 305 square miles area, lying on the northerly slope of the Olympics has a mean annual rainfall of perhaps 70 inches, which aided by the melting snows

of the glaciers, ensures a reliable and never failing supply of water for power development. The stream discharge varies from a minimum of 1000 cu. ft. per second in summer, to a maximum flood flow of 28,000 cu. ft. per second, during the winter, or "rainy" season. Summer depletion is prevented by the perpetual reservoirs, formed by the snow and ice deposits at the higher elevations.

The present or "canyon" power site, on the Elwha, is about eight miles southwest of Port Angeles, and provides for an ultimate development of 14,500 h.p. under a head of 100 ft., space in the power house and head works being provided for a future extension.

Other power sites have been selected for the future generation of power. One at McDonald's bridge, three and one-half miles upstream from the present plant, where under a head of 115 ft., it is estimated that 16,000 h.p. is available, while at Glines Canyon, six miles beyond, 29,000 h.p. may be generated under a head of 230 ft.—the three sites affording an ultimate development of 60,000 h.p. with an 80 per cent efficiency.

Before taking up the general discussion of the entire system, it may be advisable to state that, in order to prevent possible confusion, the detailed description of the various components in their completed state has first been made, followed by the outline of the construction of the original dam, its failure and reconstruction, and concluded by a discussion of these latter operations.

The Dam.

The dam at the Canyon plant, some 450 ft. long at the top, consists of a main section of gravity type concrete structure, closing the canyon of the Elwha—flanked by spillway and intake sections of the concrete buttressed type, founded upon the rock sides of the gorge. Near the center of the structure a 30 degrees deflection divides the entire structure into two tangent sections. The canyon, where crossed by the gravity dam has a top width of 120 ft. and a bottom width of from 80 ft. on the upstream face, to 45 ft. at the toe of the dam. The sides of the gorge ascend steeply from mean water level up to elev. 174 where they flatten out on an easy slope to the top of the dam.

The gravity dam forms a plug wedged in both vertically and horizontally between the shoulders of the gorge, so that as long as these abutments remain in place, there is no danger of its going out. The structure has a unique design—the distinguishing feature being that it is narrowest at the center, with greatest width at the ends—resembling, in outline plan, a huge hour glass.

During the repair of the dam and enlargement of plant, the north spillway was enlarged by blasting space from the canyon side, and confining this spillway channel between massive concrete retaining walls. During this same period the two spillways were equipped with structural steel tainter gates 13 ft. 9 in. by 23 ft. of the latest pattern—steel plates riveted to a frame work of channels and angles, rotating about an axis near the downstream edge of the buttresses. These may be individually raised, either locally or from the switchboard, by means of cables connected through the motor operated hoists, the latter mounted on car and rails for convenience of transfer. Impermeability is insured, when the gates are closed, by angle iron guides curved to the arc of gate motion, placed in the buttresses, while at the bottom, mechanical bearing plates serve a similar purpose.

Head Gates.

Adjacent to the north spillway, and occupying a length of some 50 ft. of buttressed dam section, are the main head gates, two 12 ft. by 15 ft. and one 5 ft. by 8 ft., forming the entrance to three pipe lines dropping to the power house below. Before entering these, all debris is removed from the water by trash racks, supported on I beams, horizontally imbedded in the buttress faces. The racks are composed of steel bars 3½ in. by 5-16 in., held together with ¾ in. rods, and

Wheel Pit, showing Penstocks and Turbine Casings.

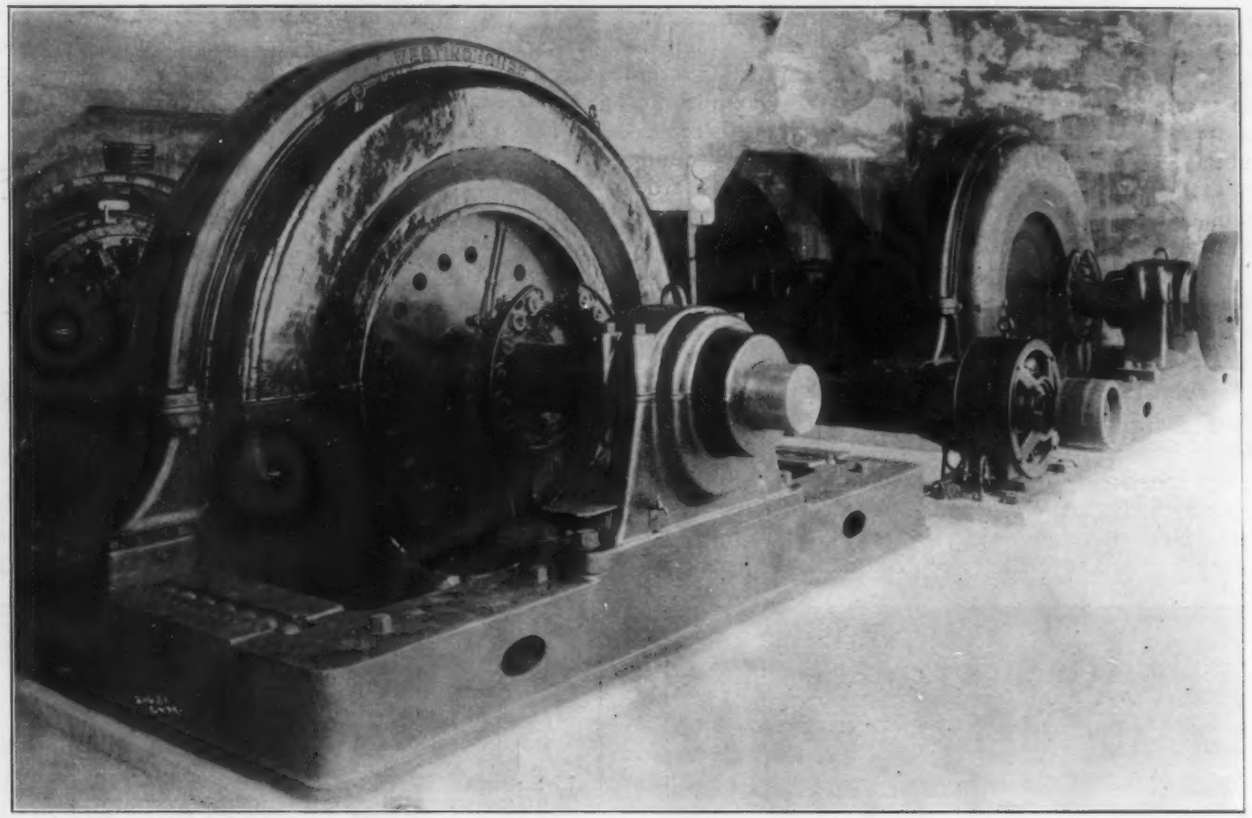
packed with ⅞ in. cast iron separators. The bars are 20 ft. long on the rake, and are set at an angle to the horizontal.

The gates are composed of one-half inch skin plates fronting structural steel frames, having built up end girders and I beam cross girders. Channels form the intermediate framing. The gates slide in grooves, armored by angles, front and back, and are sealed by rubber hose. For raising the gates an hydraulic operated hoisting apparatus controls a shaft connecting to a steel supporting framework, to which the gates are fastened.

Pipe Lines and Generating Units.

The original plant design provided for six penstocks, however, three only were installed. Two of these, 9 ft. 6 in. in diameter, are composed of open hearth steel plates, varying in thickness from ¼ in. to ⅜ in. at the power house end and supply power to operate under a 100 ft. head, two 4800 h.p. Wellman Seaver Morgan-Francis type, double runner turbines, direct connected to 3000 k.v.a. Westinghouse alternators of the revolving field type—generating three-phase current at 6600 volts, when operating at 360 r.p.m. The latter are pedestal bearing and seated upon concrete foundations.

One penstock three feet in diameter and ⅜ in. thickness of metal supplies power to a turbine unit direct connected through horizontal shafts, to a direct current exciter unit of 200 kw. capacity. The latter supplies current for the operation of a crane and the lighting of the station, in addition to the excitation of the generator field. The two remaining generator



Generating Room, showing 5000 k.v.a. Westinghouse Alternators and Lombard Governors.

penstocks, and the one exciter penstock were planned for future installation.

The larger units are regulated and controlled by Lombard governors of the oil pressure type. Oil is supplied for each governor by a triplex oil pump operated from the generator shaft by belting. The exciter is similarly controlled by a small governor of the oil pressure type. The power house structure located some 200 ft. below the dam, and accessible by means of a plank walk covering the buttresses—houses all the generating equipment.

Power House.

The power house is a fireproof structure, of the reinforced concrete column and curtain wall type, 60 ft. in height, and 90 by 70 ft. in plan, the interior being devoted to two stories, of which the lower contains the generating units, switchboard, etc., while the upper is occupied by the transformers and high tension switching apparatus—both stories being amply lighted by glass windows, set in metal frames.

The foundations rest on bedrock, and consist of concrete piers connected by concrete beams of sixteen foot span, reinforced with steel.

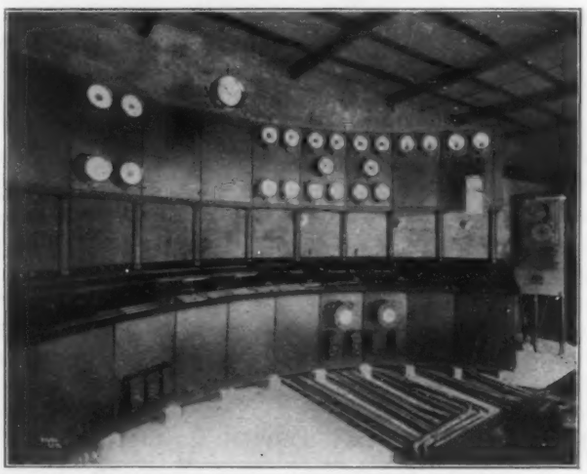
Traversing the operating room longitudinally, is a crane runway of 60 lb. steel rails bolted to 12 in. steel I beams anchored to the walls. The Whiting crane has a 30 ton main hoist, and is operated by 20 h.p. and 5 h.p. motors, respectively.

Switchboard.

The control of the station and outgoing lines is centered on a switching gallery occupying 600 sq. ft. of the southeast corner of the generating room. The gallery—accessible by an iron stairway—is supported on cast iron columns, and has a 4 in. steel and concrete floor, reinforced with wire netting.

The main switchboard of the circular bench type, consisting of a structural steel framework supporting fourteen panels of oiled black slate, includes upright instrument panels in front of and below which is a bench board, carrying the controllers for the various electrically operated switches. It has also diagrammatic miniature busses in copper, together with red and green pilot lamps, which facilitate the operation of the station, as the operator has before him an exact representation of the particular machine, transformer, etc., that is to be connected, and also an indication of the position of the main switches, which are of the electrically operated remote control type.

The switchboard of about eight ft. height traversing 120 degrees of arc, mounts the following instruments, all of Westinghouse make: ammeters, power factor indicators, cycle indicators, dial synchroscope,



Circular Bench and Panel Switchboard.

voltmeters, wattmeters (recording), watthour meter (polyphase integrating type), overload relays (single phase, inverse time limit), overload relays (single phase, instantaneous), graphic voltmeter. One upright end panel, self mounted, carries a General Electric Type T. A., form F. 12 voltage regulator. A sound proof telephone booth, located near the switchboard, against the south curtain wall, and a clock complete the list of switching gallery accessories.

Directly below the switching gallery, on the main floor, are the electric and hand operated generator and exciter field rheostats, and also the solenoid circuit breakers.

Transformer and High Tension Equipment.

The transformer and high tension switching apparatus occupies the entire second story of the power house, consisting of one large room, well lighted by windows at both the east and west sides of the structure. Near the west side, mounted on rails about twenty inches above the reinforced concrete floor, and

Transformer Room, showing Low Tension Switching Apparatus.

placed in line, are seven 1000 k.v.a. Westinghouse transformers, oil insulated and water cooled—arranged in two banks of three instruments per bank, and one to spare. These are wound for 6600 volts primary, to 38,200 volts secondary, delta connected on the low, and star connected on the high tension side, to give a resultant line voltage of 66,000. The neutral point is not grounded. A track parallels the line of transformers, on which a transfer car runs, and into which any transformer may be conveniently transferred. On the opposite side of this room are the high tension switches and feeders between transformers and transmission lines.

The low tension switching apparatus consists of five 3 pole sets of type "C" 6600 volt Westinghouse oil circuit breakers.

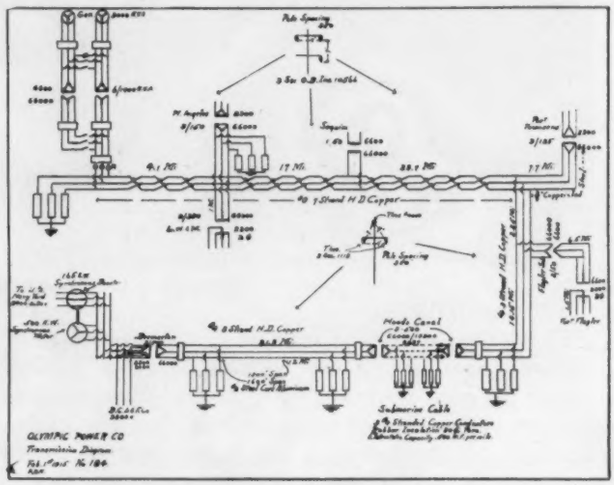
Leaving the low tension switch, the current passes through transformers—66,000 volt Kelman circuit breakers (oil switch)—and is led directly from the reactances through insulating roof bushings to the external transmission lines, electrolytic lighting arresters being externally mounted on the west side of the power house.

Transmission System.

The main line extends to Bremerton, a distance of 85.55 miles. At a point 4.1 miles from the power house the line is tapped and a stub runs through the city of Port Angeles to an open air substation consisting of two 330 k.v.a. transformers Scott connected for transformation from three to two-phase and stepping down to 2200 volts. This station supplies current to a 650 h.p. two-phase motor operated by Lewis, Wiley & Morse, contractors, who are engaged in an extensive project of hydraulic sluicing and street grading for the city.

Just beyond this tap is the Port Angeles City substation. Current is delivered to the city at 66,000 volts and stepped down by them to 2300 volts three-phase for the municipal distribution system through three 150 kw. transformers.

At Sequim, 16 miles beyond Port Angeles is a 50 kw. transformer stepping down to 6600 volts single phase for local distribution by a local company.

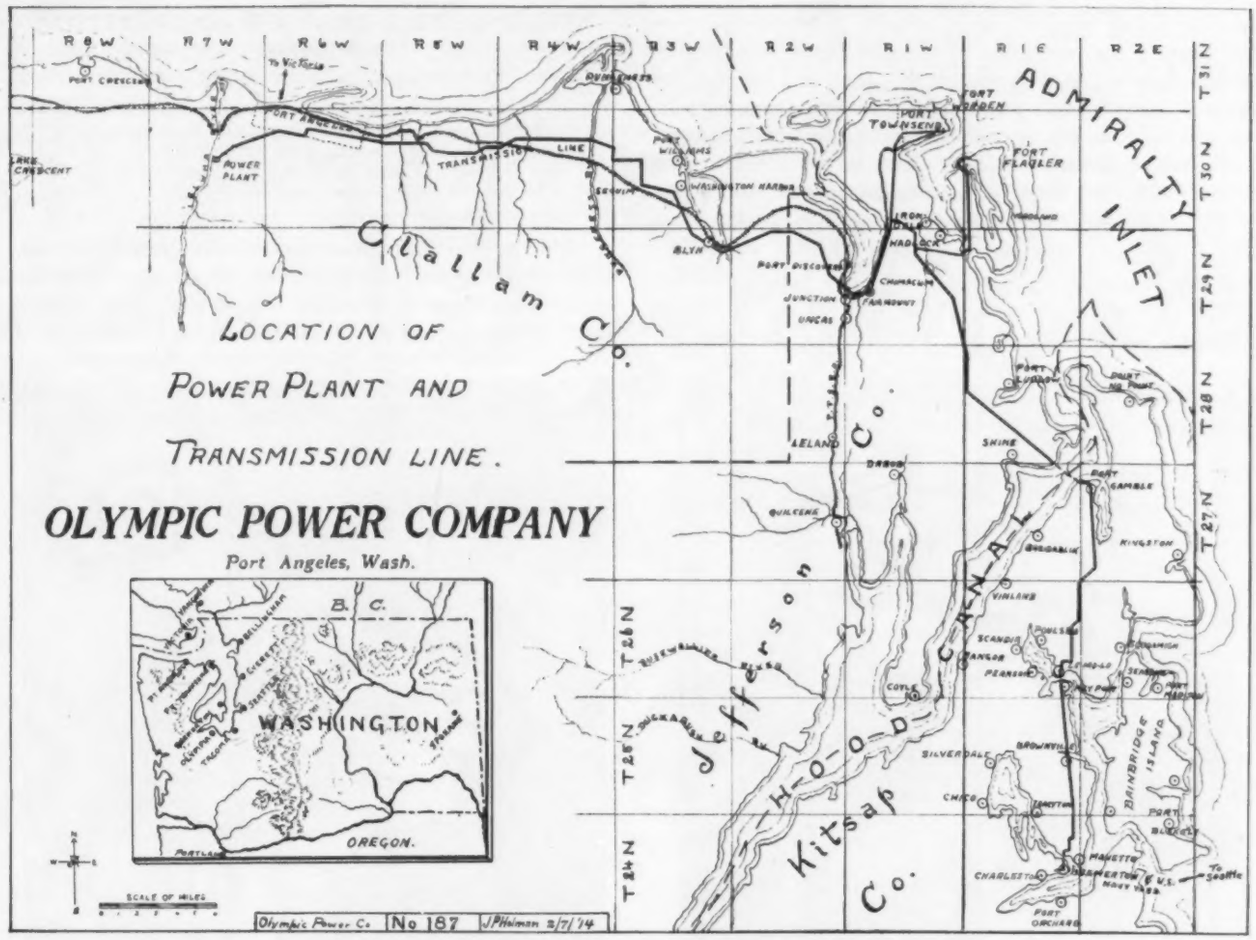


Wiring Diagram of Transmission System.

Forty miles from the power house is a switching station, open air, where the line branches to Port Townsend 7.7 miles distant. Here current is delivered at 66,000 volts to the Key City Light & Power Company. This company steps the voltage down to 2300 volts three-phase for their local dustribution through three 125 kw. oil cooled General Electric transformers located in a concrete substation. The Olympic Power Company has an arrangement with them whereby current is supplied through their transformers to Fort Worden.

Beyond Bremerton Junction, 2.25 miles, is Flagler substation, where there are two 50 kw. transformers open delta connected at 6600 volts to a line which supplies Fort Flagler, 7.45 miles from the transformers. One or two other small consumers are also suppiled from this line.

The transmission line is of interest not only because of the high voltage carried, but also because of several unusual topographical features encountered. At Hood's Canal, 47.05 miles from the power house is a galvanized iron substation containing three 500 kw. transformers, where current is stepped down to 13,200 volts. At this voltage there is a submarine cable crossing the canal, 8287 ft. in length. This cable



Map of Olympic Power Company's System.

consists of three No. 4 stranded copper conductors each insulated with 11/32 in. of rubber 30 per cent Para, the three being again insulated and the whole protected with No. 4 steel wires wound on with long lay. At the far end of the cable is another galvanized iron substation where the voltage is again stepped up through similar transformers to 66,000. Both ends of the cable are protected by automatic oil switches and electrolytic lightning arresters.

Between Hood's Canal and Bremerton are two long span crossings, one at Liberty Bay of 1300 ft. and one at Washington Narrows of 1600 ft. Both of these crossings are supported on structural steel towers 165 ft. in height, the conductors being of steel core aluminum.

At Bremerton is a concrete substation occupied jointly with the Bremerton-Charleston Light & Fuel Company. In this station are three 500 kw. transformers stepping down to 2300 volts three-phase. The B. C. L. & F. Co. have here two small steam turbines as a reserve, and from the station the O. P. Co., send out current over a 2300 volt line to the U. S. Navy Yard. Connected to the main bus in the station is a 500 kw. synchronous motor direct connected to a 165 kw. booster in the Navy Yard circuit. The field of both motor and booster are controlled by a Tirrell regulator and by this means the voltage at the substation and Navy Yard are kept constant. Very satisfactory operation is obtained even with a load which fluctuates from almost nothing to 1200 kw. in a few seconds with this arrangement.

Corner Pole.

The main transmission line from the Elwha power plant to Bremerton Junction is carried throughout on native round cedar poles, with a standard span of 350 ft. A few of these poles were installed with a concrete footing for experimental purposes—the re-

mainder being set in earth. Each pole carries two steel cross arms, which in turn carry three sets of suspension insulators, two on the top arm and one on the bottom, supporting the single circuit transmission lines. The conductors are No. 0.7-strand HD copper. The Townsend branch is of the same construction but the conductor is ⅜ in. copper clad steel.

From Bremerton Junction to Bremerton the same spacing prevails but one crossarm only is used, the third conductor being carried on a pin type insulator through-bolted to the pole at the top. The conductor on this end of the line is No. 4 strand HD copper.

Switch Tower, North Side Hood's Canal.

The distance between conductors in all cases is 7 ft. and from the power house to Bremerton Junction the line is transposed with 12 turns or 4 complete transpositions. Beyond this point there are no transpositions.

A complete telephone system is operated over the entire line. The telephone circuits of No. 10 copper clad steel are carried on wooden crossarms through-bolted to transmission poles, at a distance of about 10 ft. below the power wires and are transposed 3 times per mile. Telephone insulating transformers are installed at each instrument so arranged as to be automatically inoperative when the instruments are not in use. The transmission diagram clearly shows these features above mentioned.

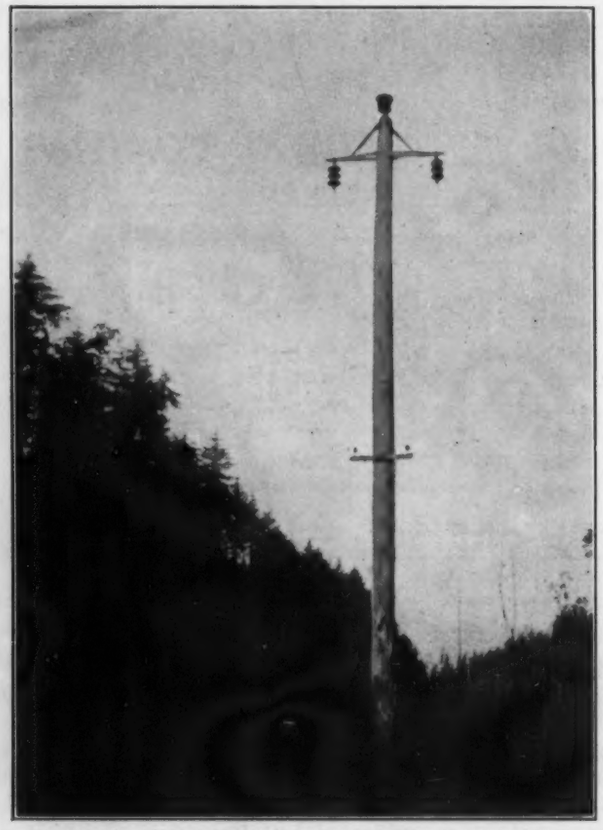
(To be concluded.)

WHAT PUBLIC SERVICE COMPETITION MEANS.

BY L. B. FAULKNER.

(This brief but effective argument against municipal competition with an established electric light and power company, was used in the papers at Olympia, Wash., and may be of use to others under similar circumstances. The author is manager of the Olympia Light and Power Company.—The Editor.)

During the last three years there has been some discussion on the question of granting light and power franchises in this city (Olympia), and more recently a disposition has been shown on the part of the



Standard Line Construction, Bremerton Extesion.

city administration to construct a municipal plant to be operated in competition with the plant of this company.

It is quite natural that those who are unfamiliar with the public utility business, and who have given little or no thought to the subject, should feel that if they could take service from either one or two companies that the contest between the two for the business would result in the best of service and lower rates, just as it would in the dry goods business or any other mercantile pursuit. We are long accustomed to witnessing competition in all lines of trade, and naturally fear and suspect any kind of monopoly as being likely to take advantage of every opportunity to enrich itself at the expense of the public, and feel that competition would be a cure for any such evil.

The legislature of Washington, in 1911, passed an act creating a public service commission and gave it full power to regulate and control the rates and service of all public utilities operating in the state, and

by virtue of this law the public is fully protected against improper or unjust charges, discrimination between consumers of the same class and inadequate service.

This simple statement alone would seem to make clear the fact that this act accomplishes all that the advocates of competition could possibly claim for it, and does so without any of the serious dangers that accompany the duplication of investments and the almost certain increase of rates that would eventually occur.

If we were dealing with a mere theory there might be some room for argument, some question as to the effect of competition, but community after community, large and small, throughout the United States, has tried the experiment only to see it fail, and Olympia might well profit by this experience.

For the express purpose of protecting the public from the ill effects of duplicate investments most of the states have passed laws compelling those who wish to compete in the public utility business to first secure the permission of the state, in the form of a certificate to the effect that the community they propose to serve is not already adequately served at reasonable rates and that competition is the only satisfactory remedy.

Such great states, for instance, as New York, New Jersey and Wisconsin will not permit competition except as a last resort, and opinions rendered by their commissions make clear the reason.

The public service commission of Wisconsin, recognized as one of the best in the United States, speaking on this subject, says:

"Duplication of lighting plants is a waste of capital whenever the service can be furnished by one plant. It necessarily means that interest must be earned on a much greater investment. Competition in this service usually means a bitter struggle and low rates until one of the contestants is forced out of the field, when the rates are raised to the old level, if not above it, or to a combination of some sort between them, which also ultimately results in higher rates. Active and continuous competition between public utility corporations furnishing the same service to the same locality seems to be out of the question. This has been shown by experience. It becomes clear that the service rendered by both companies can be more cheaply and more effectively furnished by only one of them."—Cashton Light & Power Case.

In many other Wisconsin cases that great commission has repeatedly and constantly refused to permit competing light and power companies to enter towns where service is already being properly supplied.

The public service commission of New York, also conceded to be one of the great commissions of the United States, says:

"A business which supplies to a community a public utility like electricity for light or power is one in which free and full competition between two companies engaged in the same business cannot be expected to prevail permanently. Experience has, we think, amply demonstrated the fact that when there is more than one such company in a municipality engaged in the same business, while active competition may prevail for a more or less brief period, the companies generally find it to their interest to reach an understanding, whether as to price or division of territory, and in a great majority of cases the two companies either become one, or the control of both passes into the hands of the same parties.

"It can doubtless be demonstrated beyond any possibility of successful contradiction that better service and fairer prices in furnishing such public utilities to a community can, as a general rule, be given by one company than by several. The existence of more than one company leads to duplicate development, to the building of plants that are not needed to serve the community; to the duplication of unsightly pole lines and distributing service; to costly and unnecessary tearing up and destruction of pavements and to administrative expenses greatly in excess of those which a single company would have to meet."—Lockport Light & Power Case.

Speaking on the same question of the folly of permitting competition between light and power plants the public utilities commission of New Jersey says:

"In the case of ordinary business concerns the presumption is in favor of competition. This presumption, however, commonly fails in the case of public service companies operating under franchises. * * *

"It is true that for a time public utility may compete with another supplying the same people with the same service, but experience demonstrates that such competition is likely to be short lived; that public opinion has come to recognize the almost inevitable outcome of such temporary competition between public utilities is evidenced by much recent legislation. The illusive doctrine of competition in this field is being superseded by an experiment of strictly regulated monopoly. Where competing companies, with franchises, serving the same community, finally unite, the unnecessary duplication of plant and appliances entails a permanent burden upon the public. Thus the coils of competition in such a field perpetuate themselves and burden the consuming public."—Atlantic Highlands Case.

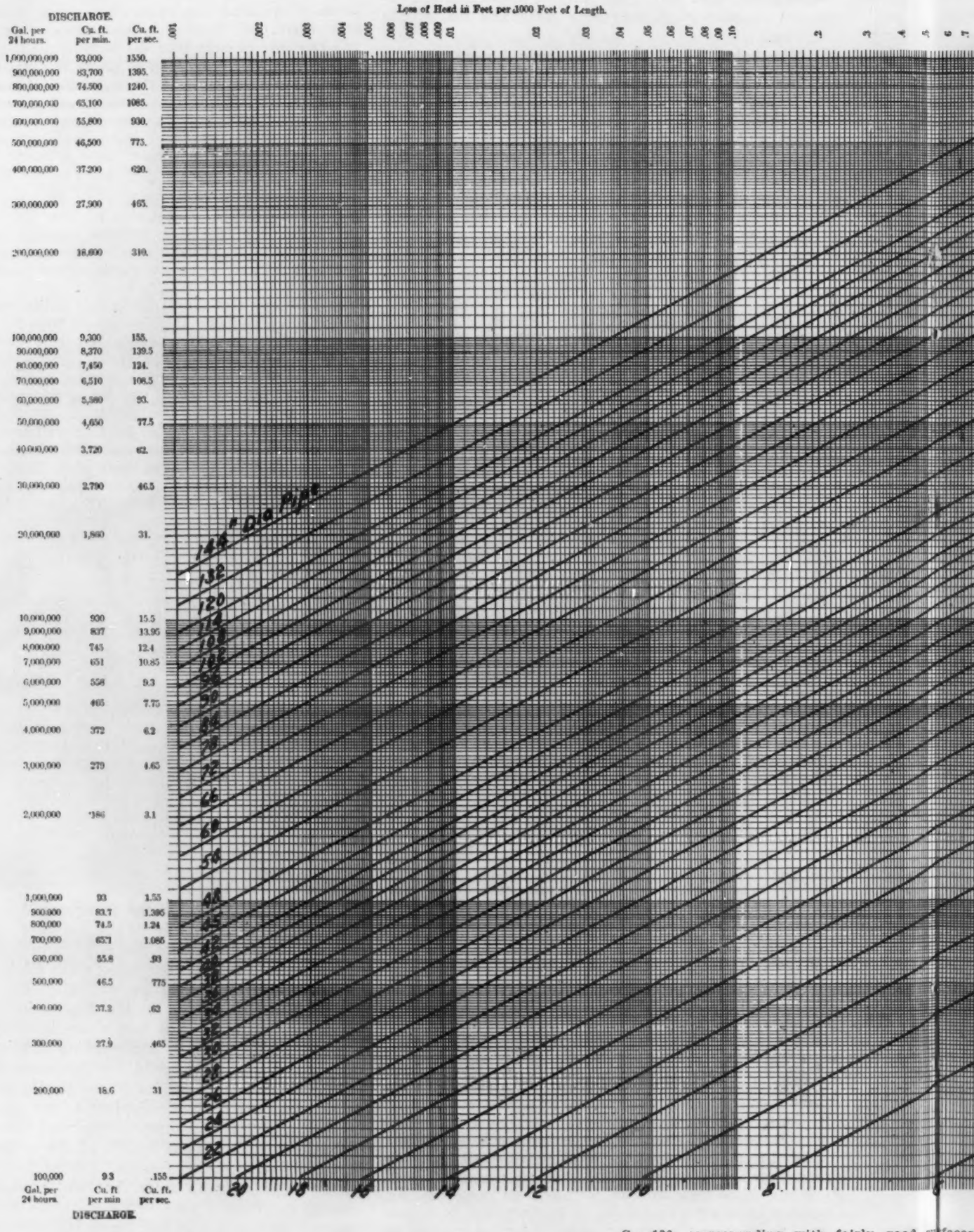
We wish to call your attention to just one more of the numerous opinions of this kind, because in a few words the New York commission has pretty well covered the whole question.

"It is the opinion of this commission that reasonable rates and good service can be obtained through the commission with greater advantage to the public than by attempting to regulate such rates and service through competition with all of its disadvantages. The policy of this commission in cases where one light and power company seeks to enter a field already occupied by another is to require that the applicant shall show that the company already serving the community is not doing so adequately and efficiently. Good service can now be obtained at reasonable prices in less expensive ways than by unnecessary duplication of plants, and the public interest does not demand that capital invested in good faith in the public service should be destroyed or impaired without good reason to be shown affirmatively."—Niagara Falls Light & Power Case.

It is apparent from the foregoing decision, that men trained in the study of the question of competition are agreed that harm, not good, invariably results.

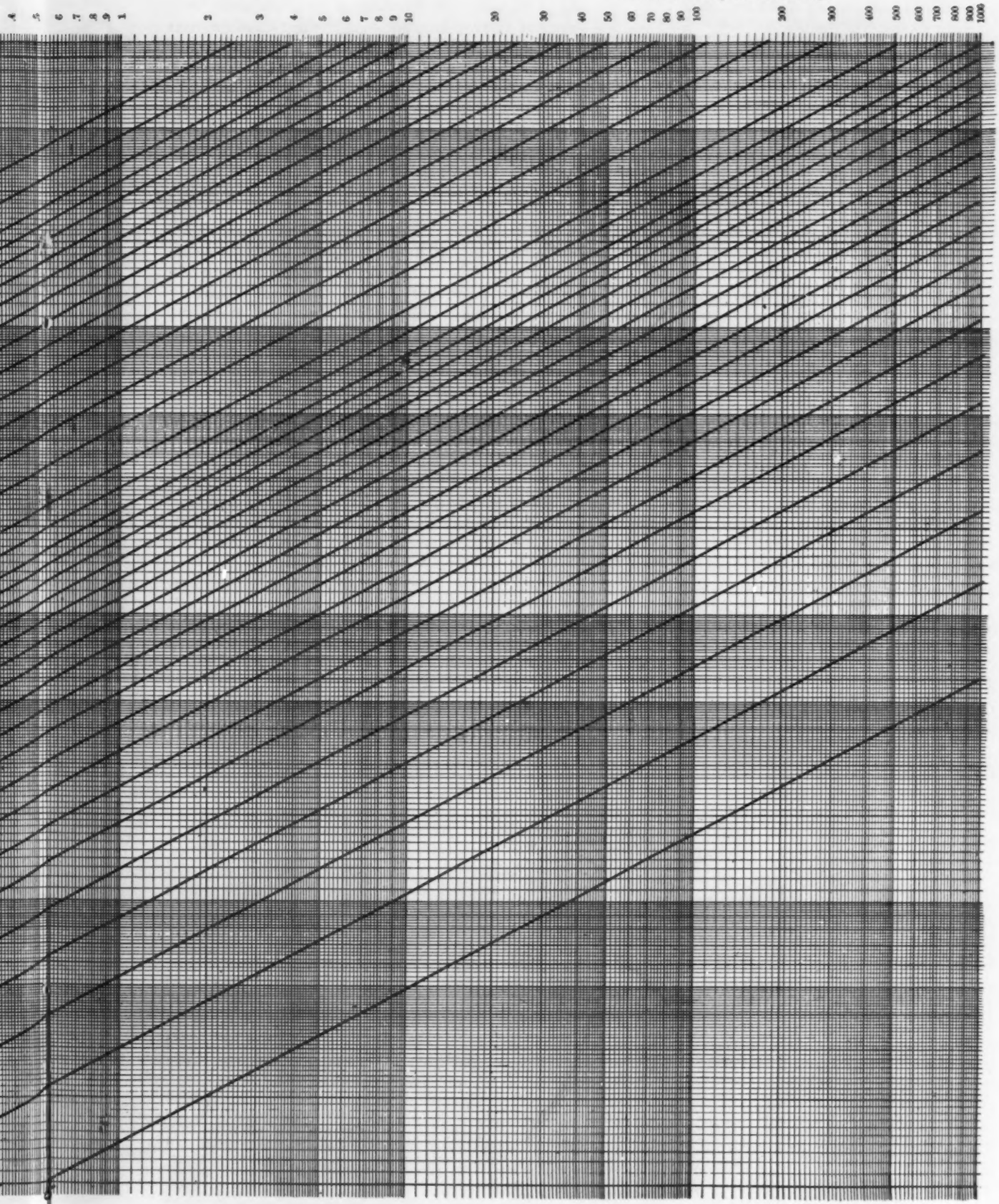
The fact that the competing plant might be municipally owned would in no way alter the situation, for the same objections to the duplication of investments would apply. In fact there is much greater danger to the public in a competing municipal plant than in one privately owned, for the reason that a private plant, when the profits do not justify it, can forego the payment of dividends, just as our company did for years, all of the money being used for necessary extensions made for the benefit of the public. But a municipal plant, being financed by the sale of bonds, must of necessity fix rates that will produce a substantial profit each year of its existence, so that the interest on the bonds can be unfailingly paid and enough earned in addition to make the necessary extensions and improvements.

CHART FOR GRAPHIC DETERMINATION OF FLOW OF W



C = 130, corresponding with fairly good surfaces

LOW OF WATER IN PIPES BY HAZEN & WILLIAMS FORMULA. PREPARED BY GEO. J. HENRY.



good surfaces of wood, cast iron or lapwelded steel.

ELECTRICAL APPLICATIONS OF ALUMINIUM

BY JOSEPH W. RICHARDS.

(While the present high price of aluminium, close to 45 cents a pound, may temporarily prohibit its use, the facts herein presented are of permanent interest. They are taken from a paper on "The Engineering Uses of Aluminium," as presented at the International Engineering Congress.—The Editor.)

The electrical engineer is particularly concerned with the large conducting power of aluminium. Here again copper is the only common metal with higher conducting power, and it is copper which aluminium is rapidly replacing. The exact figures for hard-drawn copper and hard-drawn aluminium are 97 and 61 respectively, pure copper, Matthiessen standard, being 100. As a first approximation one may say that to replace a copper wire by one of aluminium of the same conducting power, increase the diameter one-fourth. This increases the cross-section 56 per cent, and gives practically equal carrying power.

$$\frac{97-61}{61}\times 100 = 59 \text{ per cent.}$$

The weight of the aluminium conductor will be $159 \div 3.33 = 0.48 = 48$ per cent of the weight of the copper it replaces. As a practical basis for this replacement we may therefore figure on 60 per cent increased cross-section, and one-half the weight. Since aluminium is now sold regularly at less than double the price of copper, we may say that at present aluminium is a cheaper electrical conductor than copper.

Aside from the mere cost of the metal in the conductor, there are a number of factors which influence the question of the substitution of aluminium conductors for copper. They are mostly practical engineering considerations.

A. Where space is restricted, as in the windings of dynamos and motors, the larger section of aluminium is somewhat inadmissable. This is to some extent overcome by the method of insulating aluminium with a superficial thin chemical compound, and dispensing with the ordinary thick insulation.

B. Bus-bars in chemical plants often give trouble at connections. Aluminium is harder to keep clean and has lower resistance at the joints than copper. Copper can be satisfactorily tinned and soldered at such joints; aluminium cannot. If the aluminium joint is autogenously soldered, such difficulties disappear; if not, it must be bolted more tightly and more frequently cleaned, than copper.

C. Aerial wires for power transmission can be satisfactorily joined by the twist joint. The two ends are slipped into a flattened aluminium tube, and with powerful pliers are given a half-dozen twists. Such a joint has and retains greater conducting power than the wire itself. With heavy cables a different method is used. The two ends are inserted into a cast aluminium sleeve of proper size, and the sleeve then subjected to great pressure in a die in a hydraulic jack. The metal of the cable and the sleeve thus flow together into a solid mass. The jack can be made portable, and such joints made out in the field; the whole apparatus weighs only 200 pounds. Sometimes the compression is applied in the factory, a screw socket being thus welded on the end of a cable, enabling it to be attached to a similar screw socket by a double-threaded stud, whenever connection is to be made.

D. The cost of insulation on an aluminium wire will be some twenty-five per cent greater than on copper. But large cables for power transmission are usually strung without insulating covering; in which case this factor does not enter.

E. Hard-drawn aluminium wire being about half as strong as hard-drawn copper wire, per unit of section, the alumnium conductor with 60 per cent greater cross-section than copper is really 0.8 as strong as the copper wire which it replaces. This is, however, more than offset, in practical use, by the fact that the aluminium is only half the weight of the copper. For spans of equal length the weight of aluminium to be carried is only 50 per cent that of the copper, while its strength is 80 per cent; it is therefore relatively 1.6 times as strong. Or, putting it another way, the length of span between supports could be increased approximately 50 per cent, with the same dead-weight on the supports and the same factor of safety on the strength of the wire.

F. The increased span decreases the cost of the supports or towers on a line, the number of insulators, and the cost of erection; also the leakage to the ground through the insulators and towers. These savings are in general far more important than the saving in cost of the cable itself. In fact, the aluminium cables might be profitably used even if the wire itself cost more than copper.

G. A combination cable consisting of aluminium wires twisted upon a steel core has even greater advantages than the plain aluminium cable. Taking a hard-drawn steel wire of 160,000 lb. per sq. inch ultimate tensile strength and 130,000 lb. elastic limit, and twisting tightly upon it six aluminium wires of equal diameter, the hard drawn aluminium having 24,000 lb. tensile strength and 13,000 lb. elastic limit, there is obtained a combination which has only 80 per cent of the weight of a copper cable of equal conductivity but which is 57 per cent stronger. With about equal cost for cable it is possible to make so much longer spans with this composite cable that there are great savings in cost of erection, towers, insulators and leakage. Almost all the new high-power transmission lines are being constructed with this composite cable. The steel wire is galvanized before use, and the aluminium covering is twisted upon it so tightly as to practically protect it from air and moisture.

H. The calculation of wind stresses shows that more allowance must be made for these than for the smaller copper cable.

I. Corrosion of the aluminium is found to be no greater than that of copper cable under the same conditions. Near the sea coast, both aluminium and copper are strongly corroded by the salt moisture and they should both be insulated.

J. Where the line is at a great distance from the manufactory, the saving in freight on cable and insulators may be an important item.

K. Scrap aluminium is much less easy to melt up or to dispose of surreptitiousliy than scrap copper. It is therefore much less likely to be stolen—a fate which sometimes befalls copper cable.

REPORT ON STANDARDIZATION OF SPECIAL THREADS FOR FIXTURES AND FITTINGS.

The American Society of Mechanical Engineers committee appointed on Standardization of Special Threads has recommended the following standards for the four sizes in both male and female shells. The male shells are used on lamp bases, fuse plugs, attachment plugs, etc., and the female shells for electric sockets, receptacles and similar devices. The male shells are usually known as "lamp base screw shells" and the female as "socket screw shells."

FIG. 1. FORM AND DIMENSIONS OF THREADS FOR LAMP BASE AND SOCKET SCREW SHELLS, MINIATURE SIZE

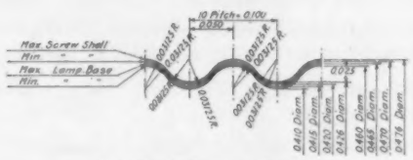


FIG. 2. FORM AND DIMENSIONS OF THREADS FOR LAMP BASE AND SOCKET SCREW SHELLS, CANDELABRA SIZE

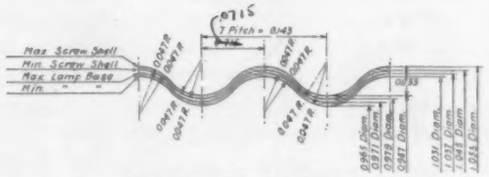


FIG. 3. FORM AND DIMENSIONS OF THREADS FOR LAMP BASE AND SOCKET SCREW SHELLS, MEDIUM SIZE

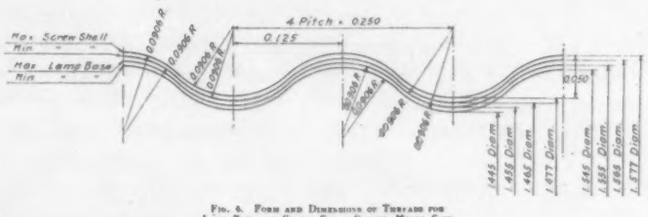


FIG. 4. FORM AND DIMENSIONS OF THREADS FOR LAMP BASE AND SOCKET SCREW SHELLS, MOGUL SIZE

Diameter Dimensions of Standards, Miniature Size.

	Socket Screw Shells	Lamp Base Screw Shells
"Go" gauge, top of thread	0.3775 in.	0.3750 in.
"Not Go" gauge, top of thread	0.3835 in.	0.3700 in.
"Go" gauge, bottom of thread	0.3375 in.	0.3350 in.
"Not Go" gauge, bottom of thread	0.3435 in.	0.3300 in.
Threads per inch	14	14
Depth of thread	0.020 in.	0.020 in.

Fig. I shows the form of thread and for convenience repeats the above dimensions.

Diameter Dimensions of Standards, Candelabra Size.

	Socket Screw Shells	Lamp Base Screw Shells
"Go" gauge, top of thread	0.470 in.	0.465 in.
"Not Go" gauge, top of thread	0.476 in.	0.460 in.
"Go" gauge, bottom of thread	0.420 in.	0.415 in.
"Not Go" gauge, bottom of thread	0.426 in.	0.410 in.
Threads, per inch	10	10
Depth of thread	0.025 in.	0.025 in.

Fig. 2 shows form of thread and for convenience repeats the above dimensions.

Diameter Dimensions of Standards, Medium Size.

	Socket Screw Shells	Lamp Base Screw Shells
"Go" gauge, top of thread	1.045 in.	1.037 in.
"Not Go" gauge, top of thread	1.053 in.	1.031 in.
"Go" gauge, bottom of thread	0.979 in.	0.971 in.
"Not Go" gauge, bottom of thread	0.987 in.	0.965 in.
Threads per inch	7	7
Depth of thread	0.033 in.	0.033 in.

Fig. 3 shows form of thread and for convenience repeats the above dimensions.

Diameter Dimensions of Standards, Mogul Size.

	Socket Screw Shells	Lamp Base Screw Shells
"Go" gauge, top of thread	1.565 in.	1.555 in.
"Not Go" gauge, top of thread	1.577 in.	1.545 in.
"Go" gauge, bottom of thread	1.465 in.	1.455 in.
"Not Go" gauge, bottom of thread	1.477 in.	1.445 in.
Threads per inch	4	4
Depth of thread	0.050 in.	0.050 in.

Fig. 4 shows form of thread and for convenience repeats the above dimensions.

For each size of lamp base screw shells there should be two threaded ring gauges to govern the diameter of the bottom of the thread outside and the form of the thread. Also two plain ring gauges to govern the diameter of the top of the thread outside. For each size of socket screw shells there should be two threaded plug gauges to govern the diameter of the top of the thread inside and the form of the thread. Also two plain plug gauges to govern the diameter of the bottom of the thread inside.

These gauges should be marked "Go" and "Not Go" respectively, according to the dimensions above given.

The oil-burning fleet of the United States would require 23,000 tons of fuel oil to keep it in active service for a single month. The combined capacity of naval storage tanks now built, and under construction, is four million gallons.

Commission jurisdiction over jitneys was denied in a recent decision of the California Railroad Commission. In the case of the Western Association of Short Line Railways against the Wichita Transportation Company, the commission declared that while motor vehicles are common carriers they were not specified by the legislature as among those utilities coming under the commission's jurisdiction.

Electro-photography for obtaining photographic impressions of coins, may be accomplished by placing an ordinary photographic plate film side up on a sheet of metal; the object to be photographed is then placed in contact with the emulsion. Wires from the poles of a high-tension transformer giving a minimum potential difference of 5000 volts are connected with the coin and metal plate respectively. The explanation of the results obtained appears to be that a glow discharge occurs between the two metallic discs which are separated by the glass of the photographic plate, and that the generation of ultra-violet rays accompanies this discharge. These rays decompose the silver bromide. Those parts nearest are subjected to strongest action, and vice versa, hence a half-tone image results.

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E. B. STRONG, President.

Sworn to and subscribed before me this 24th day of September, 1914.

(Seal.) CHARLES EDELMAN,

Notary Public in and for the City and County of San Francisco, State of California.

(My commission expires April 7, 1918.)

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Errata Note:—The chart published in the October 2d issue of this Journal was drawn for C=120, corresponding with wood, cast iron or lapwelded steel in poor condition, and not for C=140, as erroneously stated.

Yesterdays Luxury, Today's Necessity

Close upon the heels of the recent conference of central station representatives and electric heating appliance manufacturers at Portland, comes the glad tidings that many of those central stations which had not already provided a rate of three cents or better for electric cooking, are now prepared to do so and also that a material reduction in the cost of electric ranges may be looked for in the near future. With the removal of these two obstacles electric cooking ceases to be a luxury.

The difference between a luxury and a necessity is essentially that between living and existing. The measure of civilization has been the luxuries available. What modern man would be content to put up with the discomforts which even the kings of history endured. In this day and age life would not seem livable to the average individual without the electric light, the telephone, electric traction and the many other conveniences which science has given to man. Existence without them is not real living.

Electricity is fast becoming as much a necessity as water. While everyone may not absolutely need it, they want it. Electric cooking comes under this head and without doubt it will follow the general law that yesterday's luxury is today's necessity. Time and education are the only factors needed.

The cost of electric cooking, however, is subordinate to its value. Even where gas is cheap electric ranges are being installed because of the satisfaction they give. Electric lighting was introduced notwithstanding the competition of cheaper gas and the same possibilities await electric cooking.

A standard policy of rates and meters has not yet been adopted. Most of the companies seem to prefer a single meter installation, rather than the two meter system which employs one for lighting and one for cooking. A flat rate for water heating seems to be a necessary auxiliary.

A forty dollar range and three cent electricity makes electric cooking feasible for the average family excepting in localities where gas is very cheap. As was conservatively pointed out in a recent editorial herein, these two obstacles were all that stood in the way of a wide extension of the use of electricity in the household. Experience has conclusively demonstrated that the better types of electric ranges consume approximately 110 kilowatt-hours monthly in cooking all the food required for a family of five persons. At a three cent rate most housewives feel that they can afford electric cooking, especially when they take into account its greater cleanliness, convenience and the saving in food values which may thus be effected. Finally a popular priced range clinches the argument.

Annihilating Time and Space

Transcontinental wireless telephony is now a reality. Closely following that epoch-making event, the transcontinental telephone, one well may wonder what next. Early one morning last week a group of anxious listeners at Mare Island, California, were rewarded by the marvellous sound, coming literally from the boundless ether, "Hello, San

Francisco, this is Vail talking." Theodore N. Vail, president of the American Telephone & Telegraph Company, in his New York apartments, then held brief conversation with J. J. Carty, chief engineer for the company, who held the receiver at New York. Furthermore, Honolulu listened in.

This result was accomplished in co-operation with the United States Government, whose wireless equipment at Arlington, Virginia and Mare Island was utilized for the purpose. President Vail spoke into an ordinary telephone at New York, connected by wire to Arlington, where an automatic repeater communicated the message to the radio mast whence it was sent out as ether vibrations, which the sensitive receivers at Mare Island and Honolulu converted into words.

It is yet too early to tell of the details of the apparatus whereby this achievement was perfected, further than to say that new types of amplifiers were instrumental in its accomplishment. It has not been announced whether the audion or the kliotron were used, though it is safe to say that they, in conjunction with a mechanical amplifier were potent agents. It represents the combined efforts of many men for several years.

It is also of interest to note that the transcontinental telephone line was used as the return circuit, as no radio transmitter had been provided at San Francisco. Furthermore a wireless message being sent out by the Marconi company was distinctly heard over the wire circuit when a radio-receiver was placed at the mouth-piece of an ordinary telephone. Thus the telephone circuit was linked with the radio-telephone.

Almost simultaneously with the announcement of this feat word comes from Professor Michael Pupin that he has succeeded in neutralizing one of the chief difficulties in wireless telephony, the roar caused by electrostatic conditions in the atmosphere.

The practical value of these experiments resides in the possibility of trans-oceanic telephony, which offers less difficulties than transmission over land. With proper governmental regulation to obviate interference it will thus be possible for a man on the Pacific Coast to be in direct communication with a vessel crossing the Atlantic or for a person on the Atlantic seaboard to telephone to a vessel on the Pacific. Thus is man annihilating the physical limitations imposed by time and space.

Freeing the Farmer

Power companies are frequently obliged to act as bankers for rural consumers in financing electric extensions and pumping installations. Engineers have often lost opportunities to help farmers in work of reclamation and irrigation because of the farmer's inability to finance the improvement. Consequently special interest attaches to any plan for easing the financial burden on the farmer.

There is now a general sentiment throughout the nation that the farmer should have as favorable an opportunity for financing his work as is now open to the business man in the city. In many cases he is unable to obtain any credit on good security, and where a loan is made it is at a high rate of interest. This retards rural development, places an unnecessary burden upon agriculture, and adds to the high cost of living.

Various remedies for this credit lack have been tried. In Oregon, rural credit unions have been formed to give loans to their subscribers on a basis of three per cent. In Germany, under government supervision, the "landschaft," or land district, can issue debentures and extend credit to settlers. But in most localities the farmer still mortgages his farm at a high rate of interest and struggles under a load of debt for years.

A Commission on Rural Credits and Agricultural Finance is now studying the situation in California and will probably submit its recommendations to the next Legislature. But before these can be enacted the voters of the state must adopt an amendment authorizing such action. This Senate Constitutional Amendment, No. 17, will be voted on at a special election on October 26th. As its purpose is to enable the legislators to pass a law that will be constitutional as well as effective, it should have the support of all power companies and engineers.

The need for a better system of rural credits is being felt in every Western state. This is even true in projects which have been undertaken by the U. S. Reclamation Service, where many of the farmers are in financial difficulties. In addition to water rights, taxes and interest on mortgages, last year these settlers paid sixteen per cent of their crop returns to the government for installments on purchase. Much of this might be obviated, as has been suggested by Myron T. Herrick, by issuing long term debentures or bonds. The future of these semi-arid regions is dependent upon irrigation enterprises and upon the prosperity of the farmer. There can be little real prosperity, when, as government investigation has shown, the average irrigator is earning only a meagre day's wage, with perhaps 5 per cent on his investment.

Much of the proposed legislation on the subject tends toward the extension of state aid. This extreme step is not necessary as there is every reason to believe that the emergency can be met by co-operative associations among the farmers. With proper financial advice such associations could arrange for long time credit, amortization of debt and other details to be settled. These functions cannot be legally carried out until proper enabling and regulatory legislation has been enacted. This principle of self-help and individual initiative will be far more effective in accomplishing the desired result than will any plan of financial assistance from the state. Sitting on the financial safety valve is not the most approved method of speeding up human efforts.

Aside from any altruistic sentiment, it is to the direct interest of every reader of this journal to contribute his thought and action in bringing about a speedy solution of the farmer's problem. Everyone is more or less dependent upon the prosperity of the farmer and electrical men, in particular, have much to gain. Let us, therefore, help ourselves by helping him help himself.

PERSONALS

Richard A. Cooke, president of the Hawaiian Electric Company, is at San Francisco.

F. Somers, electrical contractor, San Jose, was a week end visitor at San Francisco.

R. J. McClelland, chief engineer of the Electric Bond & Share Company, is at San Francisco.

E. Genasci, an electrical contractor of Campbell, Cal., was at San Francisco during the week.

F. I. Fuller, vice-president of the Portland Railway, Light & Power Company, is at San Francisco.

F. H. Murray, represntative of the National Carbon Company, Los Angeles, is at San Francisco.

Chas. Ellicott, manager of the Westinghouse Air Brake Company, Wilmerding, Pa., is at San Francisco.

F. H. Gale, advertising manager of the General Electric Company, Schenectady, N. Y., is at San Francisco.

E. D. Farrow of the San Joaquin Light and Power Company, Fresno, Cal., was a recent visitor at San Francisco.

K. E. Van Kuran, manager for the Westinghouse Electric & Manufacturing Company at Los Angeles, is at San Francisco.

T. J. McGrath, general superintendent of the Hawaiian Electric Company, has returned to Honolulu from San Francisco.

Franklin Overbaugh, general secretary of the National Electrical Supply Jobbers' Association, Chicago, is at San Francisco.

M. O. Lacey, proprietor of the H. G. Lacey Company, Hanford, Cal., spent a few days during the week at San Francisco.

C. K. Goodwin, chief electrician of the West Side Lumber Company, Tuolumne, Cal., spent the first part of the week at San Francisco.

E. E. Cullinan, electrical engineer of the Tonopah Belmont Development Company, Tonopah, Nev., spent the week at San Francisco.

George Campbell, general manager of the Truckee River General Electric Company, Reno, Nev., was a visitor at San Francisco during the week.

K. G. Dunn, vice-president of Hunt, Mirk & Co., San Francisco, returned the latter part of the week from an extended business trip to Southern California.

A. F. Flanagan, president and general manager of the Electric Engineering and Supply Company, Stockton, Cal., spent several days at San Francisco this week.

W. P. L'Hommedieu of the Westinghouse Electric and Manufacturing Company, San Francisco, returned the first of the week from an extended Eastern business trip.

C. B. Hall, T. E. Burger, C. H. Carter, N. W. Graham and **J. M. Morris,** of Los Angeles, are attending the convention of the Pacific Coast Jobbers' Association at Del Monte.

J. C. McQuiston, advertising manager of the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., on a visit to California, is at present at San Francisco.

F. W. Hild, who recently resigned as general manager of the Portland Railway, Light & Power Company, to become manager of the Denver Tramways Company, is at San Francisco.

P. R. Thomas, representative of the R. Thomas Company, at the company's exhibit, Panama-Pacific International Exposition, left the latter part of the week for East Liverpool, Ohio.

J. G. Kellogg, vice-president of the Kellogg Switchboard & Supply Company, Chicago, Ill., and Mrs. Kellogg, are arrivals at San Francisco during the week on a tour of the Pacific Coast.

H. C. Hill of the Lynn factory of the General Electric Company, gave an illustrated talk on "The Manufacture of Alternating Current Motors," before representatives of the power companies, at the Jonathan Club, Los Angeles, on October 4th.

Judge Thomas M. Debevoise, counsel for the National Electrical Supply Jobbers' Association, who is visiting California, spent a few days during the week at San Francisco en route to Del Monte, Cal., where he expects to attend the quarterly meeting of the Pacific Coast Electrical Jobbers' Association.

J. B. Miller, president of the Southern California Edison Company; **W. A. Brackenridge,** vice-president and general manager, and **James A. Lighthipe,** chief electrical engineer, were initiated into the Jovian Order at a private rejuvenation on September 28th. This brings the total initiated in Los Angeles during the past year up to 90, which argues well for the election of Tribune **J. H. Pieper** as a member of the Jovian Congress for the ensuing year.

H. L. Monroe, Chicago; **W. J. Hanley,** Cincinnati; **W. B. Potter,** Schenectady; **W. G. Carey,** Schenectady; **W. J. Clark,** New York; E. D. Priest, Schenectady; **A. D. Arlin,** Los Angeles; **F. E. Case,** Schenectady; **J. G. Barry,** Schenectady; **C. E. Eveleth,** Schenectady; **C. E. Sprague,** Boston, and **C. R. Pierce** of Boston are among those representatives of the General Electric Company at present at San Francisco in attendance at the electric railway convention.

H. L. Garbett of the railway lighting department, East Pittsburgh, Pa.; **C. Renshaw** of the engineering department, East Pittsburgh, Pa.; **Miles B. Lambert,** railway lighting department, East Pittsburgh, Pa.; **K. E. Van Kuren,** Los Angeles; **C. W. Register,** railway department, Chicago; **L. M. Cargo,** manager Salt Lake City office; **A. Brett,** manager of the Cincinnati office; **W. D. McDonald,** manager of the Seattle office; **G. S. Vail,** manager of the Cleveland office; **Carl Wernicke,** manager of the Portland office, and **E. V. Kircher** of the Railway Department, Los Angeles office Westinghouse Electric & Manufacturing Company, are among those in attendance at the Electric Railway Convention at San Francisco.

W. F. Wallace, receiver for the Great Shoshone & Twin Falls Water Power Company, has been elected vice-president and general manager of the Electric Investment Company. He has taken over the direct management of the merger corporation, unnamed as yet, which will include the Idaho Power & Light Company, the Idaho-Oregon Light & Power Company and probably the Great Shoshone & Twin Falls and the Southern Idaho Power companies. Of this merger the National Securities Corporation is the holding concern and the Electric Investment Company is the temporary operating company. It is to be succeeded by an operating company to be named by Manager Wallace and his associates. **F. F. Johnson,** cashier of the Boise City National Bank, has been elected president of the company and will organize a local board of directors.

MEETING NOTICES

American Electric Railway Association.

The thirty-fourth annual convention of the American Electric Railway Association was opened at San Francisco 10 a. m., October 5th, by President C. Loomis Allen, with an attendance of over five hundred members and guests.

The address of welcome was given by Chester Rowell, who emphasized the social benefits which have accrued from the electric railways.

In his annual address President Allen called attention to the decrease in gross earnings by the electric railway companies for the year ending June 30, 1915, which together with the relative increase in operating expenses, have caused an

alarming decrease in net earnings. This decrease deters investment. It is consequently necessary for the public to understand that the electric railway business is not different from any other kind of business. It is greatly crippled by high wages and stringent laws. He believes that if these facts were explained to the public, if the long period of silence is broken and if proper methods of advertising are employed, the timidity of investors can be removed. After reviewing the work of the association during the past year he recommended that the legal staff be brought into closer touch with the activities of the association and that greater recognition be afforded the manufacturers' association.

Reports were received from various committees and a masterly address on "Welfare Work" was delivered by J. W. Lilienthal, president of the United Railroads of San Francisco. This will be published in these columns next week.

The remaining days of the session were devoted to receiving committe reports and to special meetings of the sections on accounting, engineering, claims, transportation and traffic. Notable addresses were delivered by Jonathan Bourne, Jr., on the "Evils of Government Ownership," and by Bion J. Arnold on "The Foundation Principles of the Evaluation of Electric Railways." These will be published later.

Independent Telephone Association.

For the first time in the history of the movement, an Independent Telephone Convention, national in character, is going to be held on the Pacific Coast. The time will be October 26th, 27th, 28th and 29th. The place will be at San Francisco, at the Exposition Memorial Auditorium.

The program will contain numerous papers by well known telephone men who are competent to handle their subjects; the following being a few of those to be presented:

"Proper Relations Between Municipalities and Public Utilities," by Charles E. Sumner of San Diego.

"Necessity for Co-operation," by A. Wardman of Whittier.

"The California Cable Bug," by Alfred Schuler of Santa Barbara.

"Past, Present and Future," by Hon. E. B. Fisher of Grand Rapids, Mich.

"Measured Service," by E. P. Morphy of Los Angeles.

"Efficiency or Inefficiency, Which?" by Charles A. Rolfe of Redlands.

"Commission Regulation from a Class C Company Standpoint," by T. H. Gould of Redondo Beach.

Los Angeles Section, A. I. E. E.

The opening session of the season of the Los Angeles Section of the A. I. E. E. took the form of a dinner in honor of the visiting delegates from the San Francisco Convention. It was held at Christopher's on September 29th, the guests being Messrs. Pope and Rushmore. Sixty members sat down to the banquet board, ably presided over by Dean Damon. Retiring President Pyle, in a few valedictory words, turned the gavel over to President Woodbury, who briefly announced his plans for the coming season, an innovation being the appointment, at this time, of meeting chairmen, each being responsible for the program and conduct of his own meeting. In response to the toastmaster's request, each one present announced his name, business connection and reason for being in Los Angeles and the newly-weds and recently made fathers received well-merited applause. Prof. Sorensen of Throop College, presented a review of electrical exhibits and advances in the art shown at the Panama-Pacific Exposition, making particular mention of a new rectifier, improved single-phase motors, the Bureau of Standards' exhibit, cathode and X-ray developments, tests of insulation by high frequency methods, etc. He urged upon the electrical engineer the necessity of closer touch with the public, the getting away from pure laboratory practice and making his appliances conform to the public's needs.

An interesting report on the Deer Park Convention of the Institute was presented by Delegate MacDonald and he was followed by Mr. Rushmore, who talked entertainingly and instructively on the future of the A. I. E. E. and the function of the engineer. He spoke of the need of co-operation between the various engineering societies, the usefulness of sections, where each man should be given some work to do and where men out of work should be brought together with men seeking talent; he urged the licensing of the engineer, so that the title would imply a definite standard and that the engineer should study investments and interest himself in public improvements. Max Loewenthal spoke in eulogistic terms of Honorary Secretary Pope and his services to the industry during the past thirty years, reading a letter of advice received by him from Mr. Pope twenty-five years ago. Secretary Pope responded in a most happy vein, giving many interesting reminiscences. He mentioned as one of the most important benefits to be derived from the sections the opportunity given to the members to get on their feet and express their views publicly, a faculty greatly needed by the engineer. He referred to the vastly growing importance of electricity on the farm, the Navy Advisory Board of 23 men, 11 of whom, by a process of natural selection, were members of the A. I. E. E. and closed with the complimentary statement that, if in his opinion, the West had been discovered first, the East probably never would have been discovered.

National Association of Railway Commissioners.

The National Association of Railway Commissioners which is composed of the public utility boards of the states of the Union, and Canada, will hold its twenty-seventh annual convention in San Francisco, the week beginning October 12.

This convention will attract many of the most noted public men of the nation. The Railroad Commission of California will give the members of the association a dinner on the second day of the convention. The speakers at this dinner will include representatives of the great public utility corporations of America, and a noted labor leader. Several are coming from the East solely for this purpose. Among those to address the meeting are Governor Hiram W. Johnson, Lieutenant-Governor John H. Eshleman, Theodore N. Vail, president of the American Telephone & Telegraph Company; Samuel Insull, president Commonwealth Edison Company of Chicago; Warren Stone, president of the Brotherhood of Locomotive Engineers; Joseph W. Folk, former governor of Missouri; J. C. Clements, Interstate Commerce Commission; William Sproule, president of the Southern Pacific Company. The speeches will be limited to fifteen minutes each, and each will deal with a single phase of the relations of public utility corporations and the people.

Portland Electric Club.

The Portland Electric Club met with the chamber of commerce at the Commercial Club, September 30th, to welcome the Eastern delegates to the American Electric Railway Association convention at San Francisco. Mr. C. C. Chapman made an address of welcome. Franklin T. Griffith acted as toastmaster. Mr. C. L. Allen, president of the association, spoke on "The Reciprocal Relations of the Public Utilities and the Public." He said his subject was divided into four parts; (1) Consumer, (2) Employe, (3) Municipality and State, (4) Investor, and there could be no development unless all had their share in the development of a utility. He thought the public needed more education along lines of railroad problems. He is a firm believer in the "Old Town Meeting System."

W. F. Hain, Washington Railway & Electric Company, spoke on the subject of "Jitneys." He said there were none in Washington, D. C., as the Public Service Commission ruled that a jitney was a common carrier. He could see no reason why they should not be regulated. They can never compete on the same basis. Can the transportation problems of New York and Philadelphia be solved by the jitney? He thinks

the jitney a civic problem and a city can not expect development along utility lines if they give unfair treatment to the utility.

C. C. Pierce, manager General Electric Company's railway department, spoke on the subject of "Sanity." He thought that representative government had come to mean "license" instead of "liberty." One of our troubles was the fact that business men would not follow the leadership of some one of their number. The West did too much talking and not enough "doing." Business men must get into politics and lend their aid to change conditions. They must not think it beneath their dignity.

Electrical Development and Jovian League.

The meeting of September 29th was held at the Palace Hotel, Vice-President E. M. Cutting, presiding. Seventy-two members were present. After the routing business was transacted the meeting was turned over to Mr. W. C. Wurfel, Pacific Coast manager of the Westinghouse Lamp Company, as chairman of the day. After a period of entertainment during which an elaborate program of vocal and instrumental talent was presented, the speaker of the day, Mr. Frank L. Brown of the Panama-Pacific International Exposition was introduced. Mr. Brown told of the efforts being made for the preservation of certain parts of the Exposition and dwelt upon the advantages to future generations and the city in general as a result of such action being taken upon the part of the citizens of San Francisco. Upon the conclusion of the address the league took unanimous action endorsing most heartily the movement under way.

Jovian Electric League of Southern California.

Nearly 200 Los Angeles Jovians and their friends assembled at Christopher's banquet hall, on Wednesday, September 29th, in order to attend the opening luncheon of the league, inaugurating the season of 1915, which promises to be as full of interest, benefit and pep as the one presided over during the past season by Tribune Pieper, who received a rousing welcome when he opened this meeting. His announcement that the Los Angeles League had initiated 90 Jovians during 1915, up to this date, although his bogie had only been set at 60, was greeted with well-merited applause. President Miller, Vice-President Brackenridge and Chief Engineer Lighthipe of the Edison Company, had recently joined the order and every district agent of the Edison Company is now a Jovian. The following local committee has been appointed to boost for Prosperity Week: Messrs. Rendler, Van Kuran, Burger, Johnson, Case, Trimble, Woodill and Pieper, augmented by the Jovian Committee, Messrs. Arbogast, Wilson and Harrison. The league, by a unanimous vote approved the Society for Electrical Development Proclamation for that week. It was resolved to send a resolution of good cheer to Harry V. Lockwood, who is quite ill and also to arrange for an Edison luncheon on October 21. As over $50 had already been collected in fines due to non-wearing of identification badges, it was concluded to purchase a $100 bond of the Children's Home Society of California, which insures the support of one child in the Home. A Jovian Boy was thus purchased and upon learning this announcement, Banker Graves, who was present as the speaker of the day, gave another $100 and a Jovian Girl was purchased. There may be keen rivalry among the members as to who will select these Jovian children. The chairman of the day was H. Jack Moulton, who had provided a splendid musical treat by presenting the Harlow trio, Judson, Sailey and Vaughn, with Miss Ruth Hagg at the piano. A "Straight from the Shoulder" talk was then delivered by Jackson A. Graves, vice-president of the Farmers' & Merchants' National Bank, a writer, sportsman and orator, on "Sons of Jove," which turned out, however, to be a masterly discussion of national policies, especially taxation and the tariff.

THE WORKMEN'S COMPENSATION, INSURANCE AND SAFETY ACT.

The Industrial Accident Commission has had prepared, for the convenience of the general public, a pamphlet combining the Workmen's Compensation, Insurance and Safety Act and the various acts amendatory of it, which were passed at the recent session of the legislature, and which went into effect on August 8, 1915. The most important amendments, other than those relating to procedure, are: First, that extending the benefits of the law to cover injuries received in the course of employment, whether accidental or otherwise; second, one empowering the commission, in special cases, to extend the time during which medical and surgical benefits shall be furnished to injured employes; and, third, one which provides that, in case of the loss of an eye or limb, an artificial member shall be furnished by the employer. Another amendment makes it a misdemeanor for an employer to exact or receive from any employe any contribution, or make any deduction from his earnings to cover any part of the cost of treatment or compensation provided by the act. There are other changes from the original text, all of which are of general interest. Copies of the pamphlet will be furnished free on application to the Industrial Accident Commission, 525 Market street, San Francisco.

EDISON RENTS BATTERIES ON A MONTHLY CHARGE BASIS.

Thomas A. Edison has developed an entirely new method for obtaining cheap delivery service. By renting his alkaline storage battery at a nominal price per month he has put the electric vehicle within the reach of every merchant and promises to eliminate the horse by making its cost prohibitive when compared to the sure and simple electric motor.

The great inventor explained his plan at a private visit of inspection to his laboratory and factories made on Monday, September 20, by the electric lighting engineers of New York and New Jersey. It consists, essentially, in the merchant purchasing his electric delivery vehicle on the installment plan and hiring the battery to run it at a nominal monthly rental. This not only makes the first cost of the equipment very low, but starts a new and very much simpler and cheaper method of operation.

Electricity is one of our few commodities that has consistently and continuously fallen in price for the past decade. The rental system of the Edison Storage Battery Company is the first real opportunity for every merchant to obtain the benefits of this cheaper electricity in reducing his delivery.

NOTABLE SIMPLEX ELECTRIC RANGE INSTALLATIONS.

A 30 ft. 8 oven Simplex elecrtic range has been sold through the Montana Power Company, Butte, Montana, to the Montana State Hospital, Warren Springs, Mont. This range is to cook the meals for from 1200 to 1500 persons daily, and so far as is known is the largest of its kind in the world. The purchase is made as a result of the excellent service given by Simplex ranges in other institutions, including one which does the cooking for 1000 daily at the Southern Indiana Hospital for the Insane, Evansville, Indiana. A two oven Simplex elecric range for hotel use has recently been shipped to the Wyoming Electric Company, Casper, Wyoming. This range is a duplicate of a Simplex range installed some time ago in the restaurant of the Ford Motor Company's administration building at Detroit, and is adapted to serve about 60 persons. Electric equipment for a large kitchenette intended for the Merritt Building, Los Angeles, said to be the finest office building in the world, has been sold through the Southern California Edison Company. The Simplex electric range included in this equipment will have a capacity for 15 persons.

NEWS NOTES

ILLUMINATION.

PHOENIX, ARIZ.—The city manager has advertised for bids for furnishing new ornamental street lighting standards.

BELLINGHAM, WASH.—The council has passed an ordinance calling for modern tungsten lamps in place of the present arc lights.

TRACY, CAL.—John F. Boals has applied for a franchise to manufacture gas and lay gas pipes in the city of Tracy. Sealed bids will be received up to November 13 for the franchise.

ESCONDIDO, CAL.—The city trustees have passed a resolution calling for a bond election for $50,000 for the construction, acquisition and completion of a municipal gas and electric plant.

MODESTO, CAL.—Sealed bids will be received up to October 12th for furnishing the necessary lamps, appliances and electricity required for lighting the Patterson Lighting District for a term of five years.

OLYMPIA, WASH.—An ordinance giving Wilbur B. Foshay, Portland, a fifty year electric light and power franchise to sell electric current to the city and for steam heating plant are now before the council.

GLENDALE, CAL.—At a meeting of the trustees the city clerk was authorized to advertise for bids for 5000 feet of conduits and 48 light standards for the North Brand Boulevard extension of the lighting system.

PULLMAN, WASH.—H. L. Burnett of Seattle has formally accepted the terms of the gas franchise recently granted to him by the city council, and the proposed $100,000 gas plant seems assured. Work on the plant will begin within 30 days.

SEATTLE, WASH.—Bids will be received by the board of public works until October 15th, for furnishing the city lighting department with approximately 292,350 incandescent lamps for the ensuing year, according to plans and specifications on file in the city hall.

KENDRICK, IDAHO.—A. V. Dunkler has filed an application with the public utilities commission at Boise, for a certificate of public convenience and necessity to permit the installation of an electric power plant to serve this village. The estimated cost of the system is $8000.

ALBANY, ORE.—An ordinance that would grant to Wm. Hoflich the right to erect a power plant to furnish electricity for light and power purposes to the city, has been referred by the council to the committee on ordinances for further consideration.

PHOENIX, ARIZ.—Work is to be commenced within ninety days by the International Gas Company of Nogales on the extension of its lines in the section of Santa Cruz county known as Patagonia and mining districts of Patagonia and Santa Rita mountains.

HONOLULU, T. H.—Negotiations between the war department and the Hawaiian Electric Company have resulted in arrangements by which the electric company will furnish light for every army post on Oahu. The carrying out of plans involves the building of a high voltage line from Honolulu to Camp Castner, a distance of 20 miles.

TRANSMISSION.

RYE, ARIZ.—Construction of a hydroelectric plant near Rye, in northern Gila county, is to be started at once.

KELLOGG, IDAHO.—The Washington Water Power Company will run a power line to the Highland Surprise property on Pine Creek.

COLVILLE, WASH.—Construction work has started on the $40,000 dam of the Stevens County Power & Light Company at Meyers Falls, under the direction of Engineer Phillips of the engineering firm of Hough & Fellers, Spokane.

MERCED, CAL.—Work has begun on the construction of the new $65,000 power plant at Merced Falls for the San Joaquin Light & Power Corporation. A. S. Kalenborn of Fresno, engineer of the company, has gone to the river site with a crew of men and will assume charge of the work.

CROCKETT, CAL.—The Great Western Power Company has applied to the railroad commission for authority to extend its power lines to connect with the warehouses of the Western Grain & Sugar Products Company at Crockett. New machinery is being installed in the old Bankers' warehouse for carrying on the business of the above firm.

TRANSPORTATION.

MEDFORD, ORE.—Steps toward securing an extension of the Bullis electric line along the Hillcrest road have been taken.

SEATTLE, WASH.—Application has been made to the city council by the port commission for a belt line franchise on East Marginal Way.

CLARKSTON, IDAHO.—The sum of $10,000 has been raised for the extension of the street car line from Sixth and Sycamore streets to Thirteenth street and Hyland avenue.

COEUR d'ALENE, IDAHO.—The council passed a franchise ordinance for the extension of electric railway tracks eastward on Mullen avenue to reach and serve the Rutledge Timber Company's mill site.

EL PASO, TEX.—An ordinance has been adopted by the city council granting to the El Paso Electric Railway Company a franchise to construct an electric railway along Piedras street, between Alameda and Boulevard streets.

LOS ANGELES, CAL.—At a recent meeting of the board of supervisors a notice of sale of franchise for an electric street railway on La Alameda alley, was presented and the matter referred to Supervisor Hinshaw for investigation.

SANTA ANA, CAL.—A movement may be started soon to grant the Pacific Electric a franchise to construct a curve at Fourth and Main streets and possible switch and siding at the Southern Pacific on North Main street.

LOS ANGELES, CAL.—The Pacific Electric Railway has been granted a franchise to construct and operate a single track electric railroad upon a portion of Figueroa street, Denver avenue, Hoover street, Menlo avenue, and Vermont avenue.

SEATTLE, WASH.—Electrification of all its lines to the west, where the power is available was decided upon at a meeting of the directors of the Chicago, Milwaukee & St. Paul Railway in Milwaukee, Wis. The directors are expected to reach Seattle shortly for inspection of the system.

LOS ANGELES, CAL.—The Pacific Electric has begun construction of a new line to serve El Segundo, Hawthorne, Lawndale, Farmington and Belvedere, and furnish an outlet from the city to the Redondo Beach section. The new line leaves the present Gardona line at Ionia avenue, at Athens-on-the-Hill and makes direct connection at Hawthorne with the El Segundo line, as well as the Belvedere line at Redondo.

TELEPHONE AND TELEGRAPH.

FAIRBANKS, WASH.—Ole Peterson of the Fairbanks Telephone Company is installing a telephone system from the upper end of Livengood Creek to the west fork in Tolovana district.

HOQUIAM, WASH.—Negotiations are under way between the Big Creek Timber Company and the forestry service to secure the rebuilding of the telephone line between Hoquiam and Humptulips.

SAN DIEGO, CAL.—The Pacific Telephone & Telegraph Company will spend $4000 to place underground cable and aerial cable construction on University avenue, also to place pole and wire construction on side streets.

NEWPORT, WASH.—Telephone linemen are building over the outside construction of the local telephone system. A complete metallic circuit is to be installed. The central office is being changed to the Rogers building.

TONOPAH, NEV.—George Wingfield of Reno and Goldfield, was elected president of the Nevada Telephone-Telegraph Company at the annual meeting of the corporation here. The company declared its twelfth dividend, payable on October 15th. Other officers elected were: F. G. Waterhouse, vice-president and general manager; J. M. Gilfoyle, treasurer, and J. Clarence Kind, secretary.

SAN FRANCISCO, CAL.—An investigation of the telephone situation throughout California with particular reference to rates, will be started by the State Railroad Commission, October 25th. The first step will be the hearing at San Francisco, by Commissioners Thelen and Gordon, of the complaint of the city and county of San Francisco against the rates of the Pacific Telephone & Telegraph Company, and the application of that company for an examination into its rates, tolls, rentals, charges, rules and regulations, and the making of such changes as the commission deems necessary to return a fair interest on the company's investment. Following the San Francisco hearing there will be a supplemental hearing in other cities of the state. The hearings in the two largest cities of the state will be simplified by the fact that the Pacific Telephone & Telegraph Company, only a few months ago, completed inventories of its operative property within the limits of these municipalities. The Home Telephone & Telegraph Company of Los Angeles also made an inventory about the same time. In its application to the commission for a resetting of rates, the Pacific Telephone and Telegraph Company states that, as it reaches practically every locality in the state, the fixing of compensation for service should be based on a valuation of the system as a whole, not on each exchange as an entity.

WATERWORKS.

BEND, ORE.—The auxiliary pumping plant of the Bend Water, Light & Power Company was destroyed by fire recently, causing a loss of $1200.

YUBA CITY, CAL.—The board of trustees has called for bids for furnishing approximately 250 water meters and necessary connections for the municipal waterworks.

BILLINGS, MONT.—The Security Bridge Company has been awarded the contract for the installation of a water plant at Fromberg. The plant will cost $15,980.

CHICO, CAL.—Frank Barnard has made application to the supervisors for a franchise to lay and maintain water pipes for the purpose of supplying water to the town of Durham.

PORTLAND, ORE.—The construction of the new headworks in the Bull Run water reserve including the erection of a dam across the Bull Run River is to be begun next spring, according to a decision reached by Commissioner Daly and the water bureau officials.

MARTINEZ, CAL.—Martinez city officials are considering a proposal to join with the Richmond Water Commission in a project to obtain a water supply in Marin county. Mayor J. W. McClellan says it has been suggested that application be made for a portion of the water that Marin county proposes to impound in the Mount Tamalpais watershed, for which bonds were voted. It is estimated that a pipe line across the bay will cost $300,000.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

The commission has issued supplemental order authorizing the Western States Gas & Electric Company to expend proceeds from sale of $74,000 bonds for plant betterments, and $10,000 bonds to reimburse company for expenditures during May, 1915. The remaining $182,000 of an authorized issue of $266,000 is authorized to be delivered to the company upon deposit with its trustee of the face value in cash of such bonds.

The commission has issued a supplemental order approving an agreement between the Consolidated Electric Company, the Great Western Power Company, the Anglo-California Trust Company, and prospective purchasers of the general mortgage bonds of the electric company to exchange the bonds of the United Light & Power Company of California and the three year collateral trust gold notes of the United Light & Power Company of New Jersey for bonds of the Consolidated Electric Company to be placed in trust with the Anglo-California Trust Company; the Consolidated Electric company at the same time to issue its bonds to these depositors. The agreement also gives power to the Consolidated Electric Company to clear the properties from the liens.

The commission has issued a supplemental order authorizing the Santa Barbara Gas & Electric Company to issue $15,000 face value of its first mortgage 6 per cent 30 year gold bonds. In its original order the commission authorized the company to sell $100,000 face value of these bonds, of which $62,000 were to be issued only after specific authorization of the use of the proceeds.

The San Diego Electric Company has filed with the commission an application for extension until October 1, 1916, of the time within which the company may issue $577,000 face value 5 per cent 40 year general first lien sinking fund gold bonds at not less than 85 per cent. The commission authorized the company on October 6, 1914, to execute a mortgage to the Union Trust Company of San Francisco, securing a possible issue in the maximum of $10,000,000 of these bonds, and to issue $4,497,000 face value of the bonds. The company has issued $3,920,000, and asks the extension of time by reason of decreased earnings, and the inadvisability of making further improvements until the earnings increase.

The Humboldt Transit Company has filed with the commission an application for authority to issue and pledge 8 first mortgage 5 per cent sinking fund thirty year gold bonds to William Butterworth as collateral security for a loan of $4000 at 5 per cent for a year or less, the money to be used for site of a car house in Eureka.

The commission has rendered a decision in the "train dispatching case," finding that tht telephone shall not be used to place "added burdens or added responsibilities upon the engineers or trainmen except in cases of emergencies."

It decided further that the new train dispatching law, which forbids the delivery or transmission of train orders by trainmen themselves, shall not apply to electric railroads, nor to prevent the calling up and receipt of orders, nor in case of accident, nor on passenger or mixed trains or any other trains after a delay of fifteen minutes.

The commission provides that crews of work trains may report by telephone for orders not exceeding three times a day.

The railroads and the brotherhoods of train employes were represented at the hearing. The railroads had applied for relief from the new law, which prohibited conductors, brakemen, engineers or firemen receiving or sending orders or reports in the movement of trains by telephone at small stations. The effect of the law was to compel railroads to have telegraph operators at all stations. The railroads produced evidence to show that not a single accident had resulted from the use of the telephone.